WHAT IS CLAIMED IS:

1. A method to create and acoustically manipulate a microbubble within a volume of material, the method comprising:

propagating at least one laser pulse through the material to create a microbubble within the material; and

propagating at least one acoustic wave through the material to a surface of the microbubble to controllably manipulate the microbubble within the material without destroying the microbubble.

2. The method as claimed in claim 1, wherein the at least one laser pulse is an ultrafast laser pulse and wherein the microbubble is created via laser induced optical breakdown (LIOB) with little or no change to material immediately adjacent to the microbubble.

3. The method as claimed in claim 1, wherein the volume of material includes a liquid or semi-liquid material.

4. The method as claimed in claim 1, wherein the at least one acoustic wave includes an ultrasound wave.

5. The method as claimed in claim 4, wherein the ultrasound wave exerts a substantially continuous force at the surface of the microbubble.

6. The method as claimed in claim 4, wherein the ultrasound wave exerts a pulsed force at the surface of the microbubble.

7. The method as claimed in claim 1, wherein the at least one acoustic wave exerts a force in the nano-Newton to micro-Newton level at the surface of the microbubble.

8. The method as claimed in claim 1, wherein the at least one acoustic wave exerts a force in the pico-Newton to femto-Newton level at the surface of the microbubble.

9. The method as claimed in claim 1, wherein the step of propagating the at least one acoustic wave causes the microbubble to exert a mechanical force on at least one structure in contact with the microbubble.

10. The method as claimed in claim 9, wherein the at least one structure is a biological structure.

11. The method as claimed in claim 1, wherein the step of propagating the at least one acoustic wave causes the microbubble to move within the volume of material.

12. The method as claimed in claim 11 further comprising measuring elasticity of material in contact with the microbubble based on movement of the microbubble.

13. The method as claimed in claim 11, wherein the step of propagating the at least one acoustic wave causes the microbubble to mix the material.

14. The method as claimed in claim 1, wherein the microbubble is a nanobubble.

15. The method as claimed in claim 1, wherein the step of propagating the at least one acoustic wave causes the microbubble to manipulate at least one structure in contact with the microbubble.

16. The method as claimed in claim 1, wherein the volume of material is a cell culture or intact tissue.

17. The method as claimed in claim 1, wherein the volume of material is an extracellular medium of a diffuse cell culture and wherein the step of propagating the at least one acoustic wave causes the microbubble to manipulate at least one cell for patterning.

18. The method as claimed in claim 1, wherein the at least one laser pulse is a femtosecond laser pulse.

19. The method as claimed in claim 1, wherein the microbubble has an optical refractive index different from an optical refractive index of the material and wherein the method further comprises propagating a beam of light through the microbubble.

20. The method as claimed in claim 2, wherein the step of propagating the at least one laser pulse also creates at least one acoustic shock wave via LIOB wherein the at least one acoustic shock wave operates as a high frequency, high precision acoustic source.

21. A system to create and acoustically manipulate a microbubble within a volume of material, the system comprising:

a pulsed laser for generating at least one laser pulse;

an optical subsystem for directing the at least one laser pulse to the material wherein the at least one laser pulse propagates through the material to create a microbubble within the volume of material; and

an acoustic source for directing acoustic energy to the material wherein at least one acoustic wave propagates through the material to a surface of the microbubble to controllably manipulate the microbubble within the volume of material without destroying the microbubble.

22. The system as claimed in claim 21, wherein the microbubble is created via laser induced optical breakdown (LIOB) with little or no damage to material immediately adjacent to the microbubble.

23. The system as claimed in claim 21, wherein the source is an ultrasound source and wherein an ultrasound wave is propagated in a direction through the material and wherein the microbubble moves in the direction of the ultrasound wave.

24. The system as claimed in claim 21, further comprising a modulated acoustic source for directing modulated acoustic energy to the material wherein at least one modulated acoustic wave propagates through the material to the microbubble to cause the microbubble to mix material in a neighborhood of the microbubble.

25. The system as claimed in claim 21, wherein the at least one laser pulse is an ultrafast laser pulse.

26. The system as claimed in claim 21, wherein the volume of material includes a liquid or semi-liquid material.

27. The system as claimed in claim 21, wherein the at least one acoustic wave includes an ultrasound wave.

28. The system as claimed in claim 27, wherein the ultrasound wave exerts a substantially continuous force at the surface of the microbubble.

29. The system as claimed in claim 27, wherein the ultrasound wave exerts a pulsed force at the surface of the microbubble.

30. The system as claimed in claim 21, wherein the at least one acoustic wave exerts a force in the nano-Newton to micro-Newton level at the surface of the microbubble.

31. The system as claimed in claim 21, wherein the at least one acoustic wave exerts a force in the pico-Newton to femto-Newton level at the surface of the microbubble.

32. The system as claimed in claim 21, wherein the at least one acoustic wave causes the microbubble to exert a mechanical force on at least one structure in contact with the microbubble.

33. The system as claimed in claim 32, wherein the at least one structure is a biological structure.

34. The system as claimed in claim 21, wherein the at least one acoustic wave causes the microbubble to move within the volume of material.

35. The system as claimed in claim 34, wherein the at least one acoustic wave causes the microbubble to mix the material.

36. The system as claimed in claim 21, wherein the microbubble is a nanobubble.

37. The system as claimed in claim 21, wherein the at least one acoustic wave causes the microbubble to manipulate at least one structure in contact with the microbubble.

38. The system as claimed in claim 21, wherein the volume of material is a cell culture or intact tissue.

39. The system as claimed in claim 21, wherein the volume of material is an extracellular medium of a diffuse cell culture and wherein the at least one acoustic wave causes the microbubble to manipulate at least one cell for patterning.

40. The system as claimed in claim 21, wherein the at least one laser pulse is a femtosecond laser pulse.

41. The system as claimed in claim 21, wherein the microbubble has an optical refractive index different from an optical refractive index of the material and wherein the system further comprises means for propagating a beam of light through the microbubble.

42. The system as claimed in claim 22, wherein the at least one laser pulse also creates at least one acoustic shock wave via LIOB wherein the at least one acoustic shock wave operates as a high frequency, high precision acoustic source.

43. The system as claimed in claim 34 further comprising means for measuring elasticity of material in contact with the microbubble based on movement of the microbubble.